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(54) Sunscreen Composition for Hair Protection

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ABSTRACT

A sunscreen composition for application to hair is provided comprising a mousse base or concentrate containing a sunscreen agent therein, said mousse base or concentrate comprising a cationic surfactant substantive to hair and a nonionic film-former which in combination with a nonionic surfactant produces foam in the composition and upon application to hair forms a coating thereon.

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SUNSCREEN COMPOSITION FOR HAIR PROTECTION

This invention relates to new cosmetic compositions for the protection of the hair from the bleaching effect of sunlight and more particularly to sunscreen mousse products for use in protecting the hair from bleaching by sunlight.

Radiation of light having wavelengths ranging from 2950 Å. to 4000 Å. produces pigmentation or tanning on the human skin. Light of wavelengths ranging from 2950 Å. to 3150 Å. of sufficient intensity produces erythema, while light of wavelengths from 3150 Å. to 4000 Å. produces an apparent direct tanning after exposure of sufficient duration and intensity without an accompanying erythema.

The prior art utilizes sunscreen agents, applied to the skin in suitable formulations, to provide protection against erythema causing radiation and to provide the desired degree of tanning with safety. Sunscreen formulations are generally tailor-made to possess sun protective factors (SPF) ranging from 2 to 15 to provide for various degrees of protection and tanning. The agents used in sunscreen formulations include para-aminobenzoates, benzophenones, cinnamates, salicylates, gallates and mixtures thereof.

Radiation of light having wavelengths ranging from 2950 Å. to 4000 Å. not only affects the skin but also the hair and may result in physical and chemical changes such as weakened, dry and brittle hair structure. The most apparent of these changes is the "bleached" appearance of the hair after exposure to intense sunlight especially during the summer months.

1 Hair treatment products in the form of
shampoos, conditioners, rinses, setting lotions,
permanent wave agents and the like do not provide
protection against damage caused by radiation and
5 especially against the bleaching effect.

The present invention addresses this
problem by providing sunscreen mousse products which,
when applied to the hair, substantially block or
reduce the amount of radiation reaching the hair and
10 thereby inhibit the bleaching thereof.

The present invention relates to a sun-
screen composition comprising an effective amount of
a water miscible sunscreen agent contained in a
mousse base or concentrate; said mousse base or
15 concentrate comprises a cationic surfactant which is
substantive to the hair by virtue of electrostatic
attraction and a nonionic film-former which in
combination with a nonionic surfactant produces foam
in the composition and upon application to hair
20 forms a coating thereon and thereby provides holding
effect to the hair.

The sunscreen agents used in the composition
of the present invention must be compatible with the
mousse-base or concentrate, i.e. must be at least water
25 miscible and preferably water soluble. In addition,
the sunscreen agents should not affect the ideal
white color of the foam and consistency of the mousse
base or concentrate.

The composition of the present invention,
30 in the form of a generally white foam contained in a
pressurized container, is useful for conditioning
the hair while at the same time protecting the hair

- 1 from the harmful rays of the sun which tend to weaken,
 break and bleach the hair. The composition may be
 used on dry as well as wet hair which has been
 shampooed or cleaned or at any time when a "wet
 5 look" or a custom styling of the hair is desired.

The general formula for compositions of the
 present invention is as follows:

	<u>Ingredients</u>	<u>% w/w</u>
	Sunscreen agent	0.001-15.0
10	Alcohol	2.0 -15.0
	Nonionic resin/film-former	0.5 -10.0
	Nonionic surfactant/emulsifier/ foam producer	0.1 - 2.0
	Fragrance	0.01 - 0.2
15	Protein conditioner	0.01 - 0.5
	Water soluble plasticizer	0.1 - 0.8
	Cationic surfactant	0.1 - 5.0
	Acid to maintain pH at 4.5-6.5	0.001- 1.0
	Nonionic surfactant/stabilizer	0.1 - 1.0
20	Water	qs. to 100

Sunscreening agents normally used to
 absorb sunlight are oil miscible and water immiscible.
 The sunscreen agent of the present invention must be
 25 water miscible and preferably water soluble. Water
 soluble sunscreen agents of the present invention
 include: ethoxylated p-amino benzoate (Peg-25 PABA,
 sold by BASF), diethanol amine salt of p-methoxycinnamic
 acid (Parsol Hydro sold by Givaudan Corp.), 2-hydroxy-
 30 4-methoxy-benzophenone-5-sulfonic acid and disodium 2,2'
 dihydroxy-4-4'-dimethoxy-5-5'-disulfonylbenzophenone,
 p-dimethylamino benzoic acid dimethylamino propyl
 amine salt, p-dimethylamino benzoic acid diethanol amine
 salt, and trimethyl-2-hydroxy propyl-p-dimethylamino
 35 benzoate ammonium chloride.

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1 Other sunscreen agents used in the present
invention are those soluble in alcohols and compatible
with water, such as 2,4-dihydroxybenzophenone,
2-hydroxy-4-methoxybenzophenone, 2,2',4,4'-tetra-
5 hydroxybenzophenone and 2,2'-dihydroxy-4-4'-dimethoxy-
benzophenone.

10 While the concentration of a sunscreen
agent or a mixture of sunscreen agents according to
the present invention may be as high as 15% w/w, we
prefer to use a concentration from about 0.001% to
about 0.5% and more preferably from about 0.001% to
0.1%. The reason for this preference is that some
sunscreen agents at or about 0.5% w/w or higher may
impart an esthetically undesirable color to the
15 mousse formulation.

The preferred alcohol used in the practice
of the present invention is ethanol; however, the use
of other low molecular weight alcohols is also con-
templated, such as n-propanol and iso-propanol.

20 The preferred nonionic polymer which upon
application of the mousse formulation forms a film
coating on the hair is a copolymer of vinyl acetate
and vinyl pyrrolidone, sold as a liquid in 50%
ethanol as PVP/VAE735. This nonionic polymer used
25 together with a nonionic surfactant, acting as an
emulsifier, such as Olet^{*} 20 (polyethylene glycol
ether of Oleyl Alcohol that conforms to the formula
 $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$, where n has
an average value of 20) produces the desired foam
30 consistency and degree of hold characteristic of
mousse formulations.

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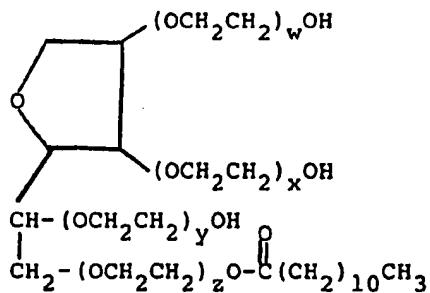
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1 In addition to Oleth 20, other nonionic surfactants may be used, such as: Oleth 10 (polyethylene glycol ether of Oleyl Alcohol that conforms to the formula $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$, where n has an average value of 10); Steareth 2 (polyethylene glycol ether of Stearyl Alcohol that conforms to the formula $\text{CH}_3(\text{CH}_2)_{16}\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$ where n has an average value of 2); Steareth 20 (polyethylene glycol ether of Stearyl Alcohol that conforms to the formula $\text{CH}_3(\text{CH}_2)_{16}\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$ where n has an average value of 20); Polysorbate 20 (mixture of laurate esters of sorbitol and sorbitol anhydrides, conforming generally to the formula

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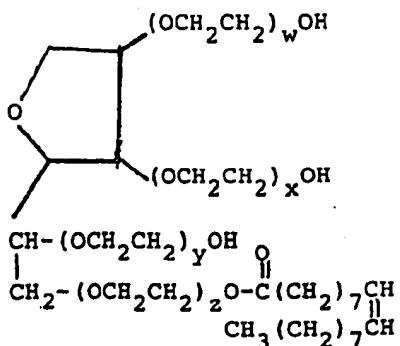


where $w + x + y + z$ has an average value
25 of 20); and Polysorbate 80 (mixture of oleate esters of sorbitol and sorbitol anhydrides, conforming generally to the formula

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10 where $w + x + y + z$ has an average value
of 20).

As a plasticizer, we prefer to use Dimethicone copolyol (a polymer of dimethylsiloxane with polyoxyethylene and/or polyoxypropylene side chains) sold under various trade names, such as *Dow Corning 193 Surfactant (Dow Corning) and *Silicone L-720 (Union Carbide). However, other water soluble silicone plasticizers may also be used as well.

20 A cationic salt which is substantive to the hair by electrostatic attraction is used in the formulations of the present invention. *Quaternium-26 (Minkamidopropyl dimethyl 2-hydroxy-ethyl ammonium chloride) is preferred; however, other cationic salts, 25 such as *Quaternium-24 (Decyl dimethyl octyl ammonium chloride) or *Quaternium-30 (Isododecylbenzyl triethanol-ammonium chloride) may also be used.

The nonionic surfactant Octoxynol-9
 $(C_8H_{17}C_6H_4(OCH_2CH_2)_nOH$ where n has an average value
30 of 9) is used as a stabilizer in the present invention.
In its place, or in admixture therewith other nonionic
surfactants may also be used, such as Octoxynol-7
(Polyethylene glycol (7) octyl phenyl ether that

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- 1 conforms generally to the formula $C_8H_{17}C_8H_4(OCH_2CH_2)_nOH$ where n has an average value of 7) and Octoxynol-10 (Polyoxyethylene (10) octyl phenyl ether that conforms generally to the formula $C_8H_{17}C_6H_4(OCH_2CH_2)_nOH$ where n has an average value of 10).

5 To provide for the desired foam properties, the pH should be maintained at about 4.5 to 6.5 and preferably at 4.5 to 5.5.

- 10 The following non-limiting examples illustrate the compositions of the present invention.

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EXAMPLE 1

	<u>Ingredients</u>	<u>% w/w</u>
5	2 parts Lusantan*-25/1 part Parsol Hydro (Ethoxylated p-amino benzoate/diethanol amine salt of p-methoxy-cinnamic acid)	13.8
	SDA 40 (Ethyl alcohol)	5.0
10	PVP/VAE735 (Copolymer of vinyl acetate and vinyl pyrrolidone)	2.0
	Oleth-20 (Polyethylene glycol ether of oleyl alcohol-20 ethylene glycol units)	0.5
	Fragrance	0.1
15	Hydrolyzed animal protein	0.01
	Dimethicone copolyol (Polymer of dimethylsiloxane with polyoxy-ethylene and/or polyoxypropylene side chain)	0.15
20	Quat 26 (Mink amido propyl dimethyl 2-hydroxy ammonium chloride - Van Dyk's Ceraphyl 65)	0.25
	Citric Acid pH 4.5-5.5	0.008
	Octoxynol 9 (Ethoxylated octylphenol-TritonX-100, Rohm & Haas)	0.2
25	Water	qs. to 100

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EXAMPLE 2

	<u>Ingredients</u>	<u>% w/w</u>
5	Hydroxyethyl cellulose	0.225
	Benzophenone-9	0.001
	Hyd. animal protein	0.010
10	Steareth-2	0.500
	Dimethicone copolyol	0.300
	Nonoxynol-10	0.150
	Polysorbate-20	0.638
15	Polyquat [*] -11	2.000
	SDA 40B	3.000
	Tallowtrimonium [*] Cl	0.500
	Polyquaternium-4	0.050
	Benzophenone-2	0.001
20	PVP/VAc Copolymer	6.750
	Water	q.s. 100

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EXAMPLE 3

	<u>Ingredients</u>	<u>g w/w</u>
5	Hydroxyethyl cellulose	0.300
Ammonium hydroxide	0.050	
Benzophenone-9	0.001	
10 Hydrolyzed animal protein	0.010	
Nonoxynol-10	0.150	
Dimethicone copolyol	0.300	
Trimethyl tallow ammonium chloride	0.500	
Polyquaternium 11	2.000	
15 Polysorbate-20	0.638	
Citric acid	0.050	
Palmitoyldimonium hyd. animal collagen	0.300	
20 SDA alcohol 40B	3.000	
Benzophenone-2	0.001	
Sorbitan sesquioleate	0.362	
PVP/VA copolymer (50% in alcohol)	3.000	
25 Fragrance	0.200	
Water	q.s. 100	

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EXAMPLE 4

	<u>Ingredient</u>	<u>% w/w</u>
5	Hydroxyethyl cellulose	0.300
	NH ₄ OH	0.030
	Benzophenone-9	0.050
10	Hydrolyzed animal protein	0.010
	Nonoxynol-10	0.150
	Dimethicone copolyol	0.300
	Tallowtrimonium chloride	0.500
15	Polyquaternium-11	2.000
	Polysorbate-20	0.638
	Citric acid	0.040
20	SDA 40B	3.000
	Benzophenone-2	0.050
	PVP/VA copolymer	5.000
	Water	q.s. 100

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EXAMPLES 5 - 8

	<u>Ingredients</u>	5 g w/w	6 g w/w	7 g w/w	8 g w/w
5	Hydroxyethyl cellulose	0.150	0.150	0.150	0.150
10	NH ₄ OH	q.s.	q.s.	q.s.	q.s.
10	Benzophenone-9	0.001	0.001	0.001	0.001
15	Hyd. animal protein	0.010	0.010	0.010	0.010
15	Noxoxytol-10	0.150	0.150	0.150	0.150
15	Demethicone copolyol	0.200	0.200	0.200	0.000
20	Polyquat-11	2.000	2.000	2.000	2.000
20	Polysorbate-20	0.200	0.600	0.600	0.600
20	Tallowtrimonium Cl	0.400	0.400	0.400	0.400
25	Polyquat-4	0.200	0.200	0.200	0.200
25	Citric acid	q.s.	q.s.	q.s.	q.s.
25	SDA 40B	3.000	3.000	3.000	3.000
25	Benzophenone-2	0.001	0.001	0.001	0.001
25	PVP/VA E-735	6.750	6.750	6.750	6.750
30	Sorbitan sesquioleate	0.200	0.400	0.400	0.400
30	Laureth-4	0.250	0.000	0.000	0.000
30	Steareth-2	0.000	0.000	0.200	0.000
30	Water	q.s. 100	q.s. 100	q.s. 100	q.s. 100

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EXAMPLES 9 - 13

	<u>Ingredients</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>
		<u>% w/w</u>				
5	Hydroxyethyl cellulose	0.150	0.300	0.300	0.300	0.300
10	NH ₄ OH	q.s.	0.030	0.030	0.030	0.030
	Benzophenone-9	0.001	0.001	0.001	0.001	0.001
	Hyd. animal protein	0.010	0.010	0.010	0.010	0.010
	Dimethicone copolyol	0.200	0.300	0.300	0.300	0.300
15	Polyquat-11	2.000	2.000	2.000	2.000	2.000
	Polysorbate-20	0.200	0.638	0.638	0.638	0.638
	Polyquat-4	0.050	0.050	0.050	0.050	0.050
	Citric acid	q.s.	0.040	0.040	0.040	0.040
20	Nonoxynol-10	0.150	0.150	0.150	0.150	0.150
	SDA 40B	3.000	3.000	3.000	3.000	3.000
	Benzophenone-2	0.001	0.001	0.001	0.001	0.001
25	PVP/VA E735	6.750	6.750	6.750	6.750	6.750
	Sorbitan sesquioleate	0.400	0.362	0.000	0.000	0.050
	Steareth-2	0.000	0.000	0.362	0.200	0.362
	Water	q.s. 100				

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EXAMPLES 14 - 17

	<u>Ingredients</u>	14	15	16	17
		% w/w	% w/w	% w/w	% w/w
5	Hydroxyethyl cellulose	0.150	0.150	0.150	0.150
	NH ₄ OH	q.s.	q.s.	q.s.	q.s.
10	Benzophenone-9	0.001	0.001	0.001	0.001
	Hyd. animal protein	0.010	0.010	0.010	0.010
	Nonoxynol-10	0.150	0.150	0.150	0.150
	Dimethicone copolyol	0.200	0.200	0.200	0.200
15	Polyquat-11	2.000	2.000	2.000	2.000
	Polysorbate-20	0.000	0.600	0.600	0.200
	Tallowtrimonium Cl	0.400	0.400	0.400	0.400
20	Polyquat-4	0.200	0.200	0.200	0.200
	Citric acid	0.020	0.020	0.020	0.020
	Steareth-20	0.850	0.000	0.000	0.000
	Polysorbate 85/Tween 185	0.000	0.000	0.000	0.200
25	SDA 40B	3.000	3.000	3.000	3.000
	Benzophenone-2	0.001	0.001	0.001	0.001
	PVP/VA E735	6.750	6.750	6.750	6.750
	Sorbitan sesquioleate	0.000	0.000	0.200	0.200
30	Steareth-2	0.150	0.000	0.000	0.000
	Sorbitan monolaurate	0.000	0.200	0.200	0.000
	Water	q.s. 100	q.s. 100	q.s. 100	q.s. 100

1 A preferred method of preparing sunscreen compositions of the present invention follows. Ingredients used in this method correspond to ingredients used in Example 2.

5 Mixture A

50-70 parts of cold water is charged into a manufacturing kettle equipped with variable speed propeller-type or counter rotation/side scraper-type agitation means. While the water is being agitated, 10 the formula amount of hydroxyethyl cellulose is added, and agitation continues until complete dispersion is obtained. Next, Benzophenone-9, Hydrolyzed animal protein, Steareth-2 and Dimethicone copolyol are added into the kettle while heating the mixture to 15 60-65°C. Heating at 60-65°C and agitation continue for at least 30 minutes so that the mixture is uniform and free of lumps. The mixture is next cooled to 40-45°C, followed by the addition of Nonoxynol-10, Polysorbate-20 and Polyquat-11. Slow agitation is 20 maintained while the mixture is cooled at 30-35°C.

Mixture B

Into a suitable size side tank are charged the formula amounts of special denatured alcohol, tallowtrimonium chloride, Benzophenone-2 and PVP/VA 25 copolymer and mixed until the ingredients are dissolved.

Mixture B is transferred into manufacturing kettle containing Mixture A while maintaining continuous slow agitation. The side tank is then rinsed with water sufficient to make the formula amount, and the 30 rinsing is charged into the kettle. The mixture is mixed for at least 30 minutes until uniform bulk is obtained. The pH is checked and, if necessary, is adjusted with citric acid or ammonium hydroxide.

1 The sunscreen composition is filled into
cans and the cans pressurized with propellents using
conventional, state of the art techniques.

5 Formulations of the present inventions were
tested on human hair by applying the same thereto
using methods conventional with mousse applications.
The formulations were found effective both with
respect to sunscreen properties and conditioning
qualities characteristic of mousse formulations.

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THE EMBODIMENTS OF THE PRESENT INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A sunscreen mousse composition comprising by weight:

0.001% to 15.0% of at least one sunscreen agent selected from the group consisting of ethoxylated p-amino benzoate, a diethanol amine salt of p-methoxycinnamic acid, 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid, disodium 2,2'-dihydroxy-4-4'-dimethoxy-5-5'-disulfobenzophenone, 2,4-dihydroxybenzophenone, 2-hydroxy-4-methoxybenzophenone, 2,2', 4,4'-tetrahydroxybenzophenone, 2,2'-dihydroxy-4,4'-dimethoxybenzophenone, a dimethylamino propyl amine salt of p-dimethylamino-benzoic acid, a diethanolamine salt of p-dimethylamino benzoic acid, and trimethyl-2-hydroxy propyl-p-dimethylamino benzoate ammonium chloride;

0.5% to 10.0% of a nonionic film-former;

0.1% to 2.0% of a nonionic surfactant selected from the group consisting of polyethylene glycol ether of oleyl alcohol having the formula $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$ wherein n has an average value of 20, polyethylene glycol ether of oleyl alcohol having the formula $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$ wherein n has an average value of 10, polyethylene glycol ether of stearyl alcohol having the formula $\text{CH}_3(\text{CH}_2)_{16}\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$ wherein n has an average value of 2, polyethylene glycol ether of stearyl alcohol having the formula $\text{CH}_3(\text{CH}_2)_{16}\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$ wherein n has an average value of 20, Polysorbate 20 and Polysorbate 80;

0.1% to 0.8% of a water soluble plasticizer;

0.1% to 5.0% of a cationic surfactant selected from the group consisting of minkamidopropyl dimethyl 2-hydroxy-ethyl ammonium chloride, decyl dimethyl octyl ammonium chloride and isododecylbenzyl triethanolammonium chloride; and

q.s. 100% water.

2. The sunscreen mousse composition of Claim 1 wherein the water soluble plasticizer is dimethicone copolyol.

3. The sunscreen mousse composition of Claim 1 or 2 having a pH of 4.5°- 5.5.

4. The sunscreen mousse composition of Claim 1 or 2 wherein the sunscreen agent is present in a concentration of 0.001% to 0.5%.

5. The sunscreen mousse composition of Claim 1 or 2 which contains a nonionic surfactant/stabilizer.

6. The sunscreen mousse composition of Claim 1 or 2 wherein the composition contains ethanol.

7. The sunscreen mousse composition of any of Claim 1 or 2, wherein the nonionic film-former is a copolymer of vinyl acetate and vinyl pyrrolidone.

8. A process for preparing a sunscreen mousse composition which comprises combining by weight, 0.001% to 15.0% of at least one sunscreen agent selected from the group consisting of ethoxylated p-amino benzoate, a diethanol amine salt of p-methoxycinnamic acid, 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid, disodium 2,2'-dihydroxy-4-4'-dimethoxy-5-5'-disulfobenzophenone, 2,4-dihydroxy-benzophenone, 2-hydroxy-4-methoxybenzophenone, 2,2',4,4'-tetrahydroxybenzophenone, 2,2'-dihydroxy-4,4'-dimethoxy-benzophenone, a dimethylamino propyl amine salt of p-dimethylamino-benzoic acid, a diethanolamine salt of p-dimethylamino benzoic acid, and trimethyl-2-hydroxy propyl-p-dimethylamino benzoate ammonium chloride; 0.5% to 10.0% of a nonionic film-former; 0.1% to 2.0% of a nonionic surfactant selected from the group consisting of polyethylene glycol ether of oleyl

alcohol having the formula $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$ wherein n has an average value of 20, polyethylene glycol ether of oleyl alcohol having the formula

$\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$ wherein n has an average value of 10, polyethylene glycol ether of stearyl alcohol having the formula $\text{CH}_3(\text{CH}_2)_{16}\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$ wherein n has an average value of 2, polyethylene glycol ether of stearyl alcohol having the formula $\text{CH}_3(\text{CH}_2)_{16}\text{CH}_2(\text{OCH}_2\text{CH}_2)_n\text{OH}$ wherein n has an average value of 20, Polysorbate 20 and Polysorbate 80;

0.1% to 0.8% of a water soluble plasticizer;

0.1% to 5.0% of a cationic surfactant selected from the group consisting of minkamidopropyl dimethyl 2-hydroxy-ethyl ammonium chloride, decyl dimethyl octyl ammonium chloride and isododecylbenzyl triethanolammonium chloride; and

q.s. 100% water.

9. The process of Claim 8, wherein the water soluble plasticizer is dimethicone copolyol.

10. The process of Claim 8 or 9, wherein the composition has a pH of 4.5 - 5.5.

11. The process of Claim 8 or 9, wherein the sunscreen agent is incorporated into the composition in a concentration of 0.001% to 0.5%.

12. The process of claim 8 or 9, wherein there is incorporated into the composition a nonionic surfactant/stabilizer.

13. The process of Claim 8 or 9 , wherein ethanol is incorporated into composition.

14. The process of claim 8 or 9 wherein the nonionic film-former is a copolymer of vinyl acetate and vinyl pyrrolidone.

